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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Jin Soo Kim

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9702

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7590

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EXAMINER

HOANG, QUOC DINH

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/734,543	KIM ET AL.	
	Examiner	Art Unit	
	Quoc D. Hoang	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 December 2003.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☒ Claim(s) 1,6 and 7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Objections*

1. Claim 1 is objected to because of the following informalities: line 2, the “an  $\text{In}_x\text{Ga}_{1-x}\text{As}$  strained layer formed” should be --forming an  $\text{In}_x\text{Ga}_{1-x}\text{As}$  strained layer--, and line 3, “ $\text{In}(\text{Ga})\text{As}$  quantum dots formed” should be --forming the  $\text{In}(\text{Ga})\text{As}$  quantum dots-- . Appropriate correction is required.

Claim 6 is objected to because of the following informalities: line 2, the “ $\text{In}_x\text{Ga}_{1-x}\text{As}$  quantum dots” should be -- $\text{In}(\text{Ga})\text{As}$  quantum dots-- . Appropriate correction is required.

Claim 7 is objected to because of the following informalities: line 2, the “strained layer 5” should be --strained layer--, and “quantum dots 7” should be --quantum dots-- . Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 1-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukai et al (U.S. Pat No. 6,815,242) (hereafter Mukai) in view of Petroff et al (U.S. Pat No. 5,614,435) (hereafter Petroff).

Regarding claim 1 Mukai teaches a method of forming quantum dots, the method comprising: forming an  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 on a buffer layer 132/134 (col. 17, lines 15-55 and

Fig. 19A-19C); and forming In(Ga)As quantum dots 138 on the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 (col. 17, lines 15-55 and Figs. 19A-19C) .

Mukai teaches the claimed invention except for the strained layer, It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to use the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 as a strained layer since it was known in the art that the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 could be used to control the lattice constant of the surface of the buffer layer, therefore the quantum dots can be shifted to a longer wavelength as taught by Mukai, column 3, line 35 through column 4, line 15).

Regarding claim 2, Mukai teaches wherein the buffer layer 132/134 is made of InAlAs, InAlGaAs, InP, InGaAsP or is a heterojunction layer of at least two of these four materials (col. 17, lines 28-32 and Fig. 19A).

Regarding claim 3, Mukai teaches wherein in the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136, "x" is 0.05 -0.45 (col. 17, line 32 and Fig. 19A).

Regarding claim 4, Mukai teaches wherein the thickness of the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 is 100nm, but do not teach the thickness of the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 in a range of 0.5 nm - 10 nm (col. 17, line 20 and Fig. 19A).

In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955)

(selection of optimum ranges within prior art general conditions is obvious). It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to use the optimum ranges for the g rate of the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer 136 in the method of Mukai et al.

Regarding claim 7, Mukai teaches wherein the  $\text{In}_x\text{Ga}_{1-x}\text{As}$  layer and the  $\text{In}(\text{Ga})\text{As}$  quantum dots can be stacked 1 to 30 sets on top of one another (see fig. 7).

4. Claim 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukai et al (U.S. Pat No. 6,815,242) (hereafter Mukai) in view of Petroff et al (U.S. Pat No. 5,614,435) (hereafter Petroff).

Mukai does not teach wherein  $\text{In}(\text{Ga})\text{As}$  quantum dots are formed by metal organic chemical vapor deposition, molecular beam epitaxial, or chemical beam epitaxial.

Regarding claim 5, Petroff teaches wherein  $\text{In}(\text{Ga})\text{As}$  quantum dots are formed by metal organic chemical vapor deposition, molecular beam epitaxial, or chemical beam epitaxial (col. 7, lines 50-65). At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the MOCVD teaching of Petroff with Mukai's MOVPE, because it would have provided a better formation of quantum dots on the substrate as taught by Petroff, column 7, lines 50-65.

Regarding claim 6, Petroff teaches wherein the thickness of the  $\text{InGaAs}$  quantum dots 38 is 3-10 monolayers (col. 8, lines 60-40 and Fig. 6e).


### *Conclusion*

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quoc Hoang whose telephone number is (571) 272-1780. The examiner can normally be reached on Monday-Friday from 8.00 AM to 5.00 PM.

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If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone numbers of the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Quoc Hoang   
Patent examiner/AU 2818

  
David Nelms  
Supervisory Patent Examiner  
Technology Center 2800